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LORAIN

Products Corporation

Lorain
12B1
POWER UNIT

instructions

INSTALLATION
OPERATION
MAINTENANCE

DESIGNERS AND MANUFACTURERS O

power equipment without moving parts SUB-CYCLE® AND FLOTRO

CONVERTERS RECTIFIERS

FOR PARTS OR SERVICE, Contact:

Lorain Products Corporation
Service Department
1122 "F" Street
Lorain, Ohio 44052
PH: (216) 288-9191
TWX: 810-426-2130

NOTE

PROGRAMMED PREVENTIVE MAINTENANCE Is Available On This And Other Lorain Products Manufactured Equipment. For Further Information, Contact "Service Manager" At The Above Address.

Lorain

12B1
POWER UNIT

Spec. No 5776-001 Serial No 1016

THIS FLOTROL IS ADJUSTED
TO 50.0 VOLTS. ____ VOLTS PER CELL
FOR A — CELL BATTERY. INPUT 117 VAC

OPTIONAL WIRING OR APPARATUS FURNISHED:
A, B, E, G, H, J, K, M, N, Q, R, S, T, V, W, X, Y, Z,
OTHER _____.
MODEL NO. 12B1 SERIAL NO. 1016
SD NO. 1421-01 ISS. NO. B
DATE 12-19-68 PER TESTED 21

FOR PARTS OR SERVICE CONTACT
LORAIN PRODUCTS CORPORATION
SERVICE DEPARTMENT
1122 "F" STREET
LORAIN, OHIO 44052
PH: (216) 288-9191
TWX: 810-426-2130

3172-412

LORAIN PRODUCTS CORPORATION
1122 F STREET LORAIN, OHIO

INSTRUCTIONS
LORAIN MODEL 12B1 POWER UNIT
SD-1421-01

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INSTRUCTIONS
LORAIN MODEL 12B1 POWER UNIT
SD-1421-01

1. RATINGS

Input: 117 volt, 60 cycle, single-phase a-c; 14.5 amperes maximum

Ringing Output: 105 volt, 20 cycle, with superimposed ringing tone; 7.5 watts

Tone Output: 600 cycle, modulated at 120 cycle; adjustable high and low level outputs, 25 milliwatt total

D-c Output: 46 to 52 volt, adjustable; 12 amperes continuous, 18 amperes intermittent

2. DESCRIPTION

LORAIN Type 12B1 Ringing, Tone, and D-c Supply furnishes ringing current with superimposed ringing tone, tone suitable for use as dial tone or busy signal, and filtered d-c which can either be used to charge a battery or can be supplied directly to load in a batteryless installation.

3. INSTALLATION

a. Mounting

LORAIN Type 12B1 Ringing, Tone, and D-c Supply is mounted on a base plate 23 by 22-1/4 inches; it has overall depth of 7-1/2 inches. Eight holes in the base plate will accept mounting screws up to 1/4 inch diameter.

b. Electrical Connections

A three wire input a-c cord and grounding-type plug are furnished. To gain access to output terminals, remove the rear cover from the 12B1 Power Unit. Output terminals are located on a terminal strip at the upper left hand side as viewed from the rear:

50 volt d-c: BAT terminals + and -
20 cycle ringing: 20 CY terminals R and RG
Low level tone: TONE terminals DT and DTG
High level tone: TONE terminals T and TG

3. b. (continued)

NOTE: If Model 12B1 Power Unit is used to charge a battery, disconnect a wire (designated SEE NOTE 104) which is connected between two terminals of a component card at lower left hand side, as viewed from rear of unit. This wire must be reconnected if unit is later used without a battery.

If an accessory Charge Failure Alarm Relay is furnished, this relay assembly can be connected to give an external alarm to show d-c output failure. Terminals 2 to 3 and terminals 5 to 6 of relay assembly each supply a closed-loop circuit to give an alarm, while closed-loop circuits between terminals 1 to 2 and terminals 4 to 5 are broken, to give a similar open-circuit actuated alarm. If Charge Failure Alarm Relay must operate another relay which requires current greater than 0.100 ampere, or supply current in excess of 0.250 ampere to resistive load, connect a 0.5 microfarad capacitor and a 100 ohm 5 watt resistor in series across terminals of relay assembly as contact protection. Contact rating is 1.0 ampere when connected in a 50 volt d-c circuit.

c. Adjustment

Input a-c voltage range, output d-c voltage, ringback tone level, dial tone level, and busy tone level are adjustable as described in paragraph 4 b, c, d, and e, below. If the d-c output is connected to charge a battery, refer also to the overload cutoff adjustment described in paragraph 4 f, below.

4. ADJUSTMENT

a. General

D-c output voltage of this LORAIN Power Supply is adjusted by means of potentiometer R6 on its front panel. To gain access to the input a-c voltage range, ringback tone level, dial tone level, busy tone level, and overload cutoff adjustments, remove the rear cover from the 12B1 Power Supply.

b. Input A-c Voltage Range

This adjustment is made by connection of adjustment lead E to taps of the power transformer T1. It adapts characteristics of the d-c supply to prevailing a-c service voltages.

(1) If possible, determine range over which a-c service voltage varies. One of three input a-c voltage ranges will usually be most suitable for prevailing a-c voltages.

4. b. (2) Make input voltage range connection as necessary:

106 to 117 volts, tap 111
111 to 123 volts, tap 117
117 to 129 volts, tap 123

c. D-c Output Voltage

Potentiometer R6 adjusts d-c output voltage between 46 and 52 volts. To increase d-c output voltage, turn R6 adjustment shaft clockwise.

d. Ringback Tone Level

Level of ringback tone, which is superimposed on ringing current output, is adjusted by connection of a green adjustment lead at taps of tone coil L203. At the factory, this lead is connected at tap M. To increase ringback tone level, reconnect adjustment lead at tap H; to decrease tone level, reconnect at tap L.

e. Dial and Busy Tone Levels

Low-level and high-level tone levels are individually adjustable by connections of leads T1 and T2, and leads T3 and T4, respectively, at taps of tone output transformer T102:

High-Level Tone		Low-Level Tone	
Voltage	Taps	Voltage	Taps
1.64	5 and 6	0.33	1 and 2
3.29	6 and 7	0.66	2 and 3
4.93	5 and 7	0.99	1 and 3
6.57	7 and 8	1.31	3 and 4
9.86	6 and 8	1.64	2 and 4
11.50	5 and 8	2.30	1 and 4

f. Overload Cutoff

As adjusted at the factory, an overload cutoff circuit limits d-c output to 18 amperes. This is an intermittent service rating; continuous service rating is 12 amperes. Overload current limit is adjusted by potentiometer R8. If d-c output is connected to charge a battery, R8 should be reset to limit d-c output to 12 amperes.

4. g. Factory Adjustments

Special adjustments are made at the factory on each LORAIN Model 12B1 Power Supply. It is recommended that no change be made in these adjustments:

(1) Resistor R7 is set to determine range over which potentiometer R6 will adjust d-c output voltage.

(2) Setting of resistor R102 adjusts frequency of 120 cycle component in dial and busy tone.

(3) Tap connections to primary windings of tone output transformer T102 determine frequency of 600 cycle component in dial and busy tone.

(4) Resistor R204 adjusts collector supply voltage of ringing oscillator transistors Q201 and Q202.

5. OPERATION

a. Starting and Stopping

To turn all power circuits of Power Supply on or off, throw the toggle switch to ON or OFF position.

b. Metering

A voltmeter indicates output voltage of D-c Supply at all times.

c. Fuses

Fuse F1 protects a-c input of this LORAIN Power Supply. Fuse F3 protects d-c output. Fuse F4 protects d-c supply to the Ringing Generator and Tone Generator circuits. Fuse F101 is in series with d-c input to Type 524AS Tone Generator; it is located on Tone Generator chassis. If necessary to replace any of these fuses, replace only with the following Bussmann fuse types and sizes, or equivalent:

Fuse F1: Type BAF 15 ampere

Fuse F3: Type BAF 20 ampere

Fuse F4: Type AGC 1 ampere

Fuse F101: Type AGC 1/2 ampere

6. D-C SUPPLY CIRCUIT DESCRIPTION

a. Input Circuit

Input a-c is supplied through power switch SW1, fuse F1, end leg windings of transductor L1, and rectifier CR1 to primary windings of power transformer T1.

Note that during some a-c half-cycles, current flows through SW1, F1, L1 end leg windings between terminals 2 and 1, one-half of CR1, and T1 primary windings. On alternate a-c half-cycles, current flows through T1 primary windings (direction reversed), the remaining half of CR1, L1 end leg windings between terminals 6 and 5, F1, and SW1. In this way, CR1 causes d-c to flow in alternate L1 end leg windings while allowing a-c to flow in T1 primary windings.

b. D-c Power Circuit

Alternating current in power transformer T1 primary windings induces alternating current in T1 secondary windings. One T1 secondary furnishes a-c to a center-tap rectifier made up of diodes CR5 and CR6. This rectifier supplies d-c to operate relay K. A T1 power secondary furnishes a-c through primary windings of current transformer T2 to full-wave bridge power rectifier CR2, which supplies d-c to load.

In event of a-c power failure, relay K releases to disconnect output from load. In event a battery was being charged, this prevents battery discharge through bleeder resistor R4.

Chokes L2 and L3, with capacitors C3 and C4, form an output filter which removes a-c ripple from CR2 output to smooth it and make D-c Supply output pure d-c. Resistance-capacitance network C2-R3 protects CR2 from voltage spikes generated in the output filter.

c. Transductor L1

Transductor L1 is the circuit element which regulates D-c Supply output voltage.

As described in a, above, direct current flows through alternate L1 end leg windings on alternate a-c half-cycles. End leg winding flux is sufficient to saturate the L1 core for a portion of each half-cycle.

So long as the L1 core is not saturated, a voltage is developed across whichever end leg winding is carrying current; however, when its core becomes saturated, essentially no voltage is developed across this winding. Since, as described in a, above, each L1 end leg winding is connected in series with primary windings of power transformer T1, T1 primary voltage increases whenever the L1 core is saturated.

6. c. (continued)

Transductor L1 has a control winding on its center leg. Direct current flows through this winding in a direction to oppose saturation of the L1 core, so that any increase in control current will reduce portion of each a-c half-cycle during which the core is saturated. This reduces effective T1 primary voltage. Conversely, a decrease in control current increases portion of each a-c half-cycle during which the core is saturated to increase effective T1 primary voltage. In this way, L1 regulates D-c Supply output voltage by varying T1 primary voltage.

Note also that L1 end leg winding current increases as D-c Supply output current increases. This acts to increase portion of each a-c half-cycle during which the L1 core is saturated, and increase T1 primary voltage, as output current increases. Since resistive voltage drops tend to decrease output voltage as output current increases, this property of L1 aids in maintaining constant output voltage despite output current variations.

d. Output Voltage Control Circuit

Resistor R14 and transductor L1 control windings between terminals 4 and 3 are connected across D-c Supply output so that current flows from positive output through R14, and L1 windings between terminals 4 to 3 to negative output. This current acts as bias to oppose L1 core saturation.

In addition to furnishing d-c to operate relay K (see b, above), diodes CR5 and CR6 also furnish d-c collector supply through choke L4 to transistors Q1 and Q2. Choke L4 and capacitor C10 form an output filter for this collector supply circuit.

Resistances R5, R6, and R7 are also connected in series across D-c Supply output. A voltage developed across portions of R6 and R7 is applied through diode CR9 to the Q1 base. Current then flows from positive output through zener diode CR10, Q1 emitter and base, CR9, a portion of R6, and R5 to negative output. This drives Q1 to conduction. It causes current to flow from positive CR5-CR6 output through L1 control windings between terminals 4 and 3, CR10, Q1 emitter and collector, and resistors R12 and R11 to negative CR5-CR6 output.

Since voltage developed across CR10, Q1, and R12 exceeds voltage developed across resistor R14, this drives transistor Q2 to conduction. Current then flows from positive CR5-CR6 output through L1 control windings between terminals 3 and 4, diode CR7, and Q2 emitter and collector to negative CR5-CR6 output. Since this current flows through L1 control windings from terminal 3 to terminal 4, it is subtracted from R14 bias current to aid L1 core saturation. Diode CR7 protects Q2 from any inverse voltage spikes which might be generated in L1 control windings or choke L5.

6. d. (continued)

Note that zener diode CR10 conducts in the reverse direction. Its characteristics are such that, once this occurs, an essentially constant voltage appears across CR10. This voltage holds Q1 emitter potential constant so that any increase in voltage developed across portions of R6 and R7 (through increase in D-c Supply output voltage) will drive Q1 to greater conduction.

When Q1 is driven to greater conduction, voltage developed across CR10, Q1 emitter and collector, and R12 is reduced. This reduces drive to Q2, reduces Q2 collector current through L1 control windings, and hence allows R14 bias current to oppose L1 core saturation to a greater extent, as necessary to reduce D-c Supply output voltage.

e. Overload Cutoff Circuit

As mentioned in b, above, primary windings of current transformer T2 are connected in series between secondary windings of power transformer T1 and power rectifier CR2. Capacitor C9 furnishes an essentially constant preload at T2 secondary windings so that T2 secondary voltage is proportional to D-c Supply output current. A portion of T2 secondary windings furnishes a-c to a center-tap rectifier made up of diodes CR3 and CR4 so that rectifier d-c output voltage is also proportional to D-c Supply output current. Filter choke L5 supplies d-c from this rectifier across series resistances R8 and R9.

Resistor R8 is adjusted so that voltage developed across R9 and a portion of R8 will not exceed voltage developed across parts of resistances R6 and R7 so long as D-c Supply output current does not exceed a given value. Diode CR8 blocks current at this time.

As D-c Supply output current increases, however, R8-R9 voltage increases until it exceeds R6-R7 voltage. At this time, current flows from positive CR3-CR4 output through CR10, Q1 emitter and base, CR8, part of R8, and L5 to negative CR3-CR4 output. Diode CR9 blocks current at this time. Overload cutoff current, in turn, drives both Q1 and Q2 to greater conduction, and increases transductor L1 control current as necessary to decrease L1 core saturation and reduce D-c Supply output voltage. In this way, output current is limited to a safe value.

7. RINGING GENERATOR CIRCUIT DESCRIPTION

a. Input Filter

Choke L201 and capacitors C201 and C202 form the Ringing Generator and Tone Generator input filter. This filter prevents noise from either Generator from being fed back to d-c supply output. Capacitor C203 furnishes additional filtering for the oscillator in the Ringing Generator.

7. b. Oscillator

Collector voltage is applied through resistors R203 and R204, and the saturable oscillator transformer T201 primary to oscillator transistors Q201 and Q202. Resistor R208 furnishes negative bias to the base of Q201. This causes Q201 to conduct and starts the oscillator cycle.

Initially, current flows from positive input through the Q201 emitter and collector, T201 primary windings between terminals 3 and 2, R204, and R203 to negative input. T201 primary current induces current in the T201 drive windings which applied to the Q201 and Q202 bases, drives Q201 to full conduction and drives Q202 to cutoff. Resistors R205 and R206 limit transistor base current.

Full oscillator input voltage applied across T201 primary windings causes primary current to increase rapidly until the T201 core becomes saturated. Q201 then limits T201 primary current, and a voltage developed across the Q201 emitter and collector causes primary current decay to reverse polarity of T201 drive voltages.

Reversed drive voltage polarity drives Q202 to conduction and drives Q201 to cutoff. When Q202 conducts, current flows from positive input through the Q202 emitter and collector, T201 primary windings between terminals 1 and 2, R204, and R203 to negative input. Note that primary current direction is now reversed. Primary current again saturates the T201 core. Q202 then limits primary current to reverse drive voltage polarity.

This cycle occurs at a frequency proportional to oscillator transistor collector voltage. Resistor R204 is adjusted to set this frequency at 20 cycles per second.

c. Power Amplifier

Oscillator current in the T201 primary induces alternating current in two T201 secondaries. These secondaries drive power amplifier transistors Q203 and Q204 alternately to conduction and cutoff.

When Q203 conducts and Q204 is cut off, the Q203 emitter-Q204 collector junction approaches negative input voltage. Current then flows from positive input through capacitor C202, output transformer T202 primary windings between terminals 1 and 5, inductor L202, and the Q203 emitter and collector to positive input.

Alternately, when Q204 conducts, the Q203 emitter-Q204 collector junction approaches negative input voltage. This causes current to flow from positive input through the Q204 emitter and collector, L202, T202 primary windings from terminal 5 to terminal 1, and capacitor C201 to negative input.

7. d. Output Circuit

Capacitor C206 and the T202 primary form a ferroresonant circuit, forced by power amplifier output to produce sine wave oscillation at 20 cycles. This induces sine wave ringing current in the T202 secondary, rather than the square wave current which would result if power amplifier output were coupled directly.

An additional advantage of the ferroresonant circuit is that, once excited to oscillation, it produces a relatively constant a-c voltage across the T202 primary. This improves Ringing Generator output voltage regulation.

Tone coil L203 resonates with capacitor C205 to introduce harmonics into the ferroresonant circuit. These harmonics are the ringing tone in Ringing Generator output.

If ringing overload occurs, current supplied by the power amplifier through the T202 primary increases. At the same time, voltage developed across inductor L202 also increases. This reduces excitation voltage to the ferroresonant circuit until it is forced to drop out of oscillation. Reduced output voltage caused by loss of ferroresonance protects the Ringing Generator against overload.

8. TONE GENERATOR CIRCUIT DESCRIPTION

One hundred twenty cycle pulse current is generated by a blocking oscillator, composed of transistor Q101, blocking oscillator transformer T101, capacitor C101, and diodes CR101 and CR102. Diode CR101 clamps Q101 collector voltage to negative collector supply voltage and prevents damage to Q101 through voltage spikes generated in T101 primary windings. Resistor R103 supplies negative base bias to Q101.

Initially, Q101 base current flows from positive ground through Q101 emitter and base, CR102, T101 secondary windings between terminals 2 and 1, R101, and R102 to negative collector supply. This drives Q101 to conduction so that current flows from positive ground through Q101 emitter and collector, and T101 primary windings between terminals 3 and 4 to negative collector supply. Secondary windings of T101 are connected to supply positive potential at R101 end of C101 when primary current flows. Primary current induces secondary current which quickly charges C101 until capacitor charge potential prevents further flow of Q101 base current and cuts off Q101. At this time, CR102 prevents capacitor discharge through R103 so that C101 must discharge through R101 and R102 to negative collector supply before Q101 base current can flow again to drive Q101 to conduction. Repetition rate of this cycle is determined by discharge time constant of C101 through R101 and R102. Resistor R102 adjusts oscillator frequency.

8. (continued)

Momentary instants of conduction in Q101 each cause a ground pulse to appear across a series circuit of capacitor C102 and primary windings of output transformer T102. Tap connections to these windings adjust resonant frequency of this circuit to 600 cycles. Thus, these ground pulses excite the resonant circuit to damped 600 cycle oscillation, with 120 cycle pulse exciting frequency superimposed.

LORAIN PRODUCTS CORPORATION
Lorain, Ohio, U.S.A.

LORAIN PRODUCTS (CANADA) LTD.
St. Thomas, Ontario, Canada

February 23, 1966

ELECTRICAL PARTS LIST
LORAIN MODEL 12B1 POWER UNIT
SPEC. NO. 5776-001

The quantity of spare parts (except fuses) listed should be sufficient for ten or less 12B1 POWER UNITS for at least 18 months.

Ref. Desig.	Lorain Products Corp. Part No.	Description	Quantity Rec. Spares
ASSEMBLIES			
	4871-311	Tone Generator Sub-Assembly	**
	4871-009	Ringing Generator	**
CR1	2821-132	Voltage Doubler Rectifier	1
CR2	2822-042	Power Rectifier	1
CAPACITORS			
C1	2715-145	5.0UF 150V	1
C2	2713-456	.25UF 600V	1
C3	2731-324	8500UF 75V, Electrolytic	1
C4	2731-324	8500UF 75V, Electrolytic	*
C9	2714-541	1.5UF 230VAC	1
C10	2731-147	100UF 25V, Electrolytic	1
C11	2731-250	1800UF 60V, Electrolytic	1
DIODES			
CR3	2812-225	1N1221 Silicon	1
CR4	2813-225	1N1221 Silicon	*
CR5	2812-215	1N1218 Silicon	1
CR6	2812-215	1N1218 Silicon	*
CR7	2812-215	1N1218 Silicon	*
CR8	2812-121	1N537 Silicon	1
CR9	2812-121	1N537 Silicon	*
CR10	2835-326	6.2V, Zener	1
FUSES			
F1	2483-434	15A, Cartridge	3
F3	2483-438	20A, Cartridge	3
F4	2483-222	1A, Cartridge	3

*This part appears more than once in this list. Use recommended spare quantity stated where part first appears in this list.

**For Rec. Spares, refer to Electrical Parts List for this assembly.

ELECTRICAL PARTS LIST
LORAIN MODEL 12B1 POWER UNIT
SPEC. NO. 5776-001

Ref. Desig.	Lorain Products Corp. Part No.	Description	Quantity Rec. Spares
INDUCTORS			
L1	4531-505	Transductor	-
L2	4421-503	Choke Swinging	-
L3	4416-502	Filter Choke	-
L4	4425-024	Filter Choke Reference	-
L5	4426-503	Filter Choke	-
METERS			
V	2943-211	0-80V DC, Voltmeter	-
RELAYS			
K	2561-010	12V, 1A Power	1
RESISTORS			
R1	2662-839	100 Ohm 2W, Fixed	1
R2	2662-823	22 Ohm 2W, Fixed	1
R3	2662-437	82 Ohm 2W, Fixed	1
R4	2656-709	75 Ohm 100W, Fixed	1
R5	2651-732	750 Ohm 5W, Fixed	1
R6	2683-228	25 Ohm 2W, Variable	1
R7	2681-414	200 Ohm 10W, Adjustable	1
R8	2683-632	40 Ohm 4W, Variable	1
R9	2662-432	51 Ohm 2W, Fixed	1
R10	2651-350	7K Ohm 3W, Fixed	1
R11	2651-735	1K Ohm 5W, Fixed	1
R12	2651-329	500 Ohm 3W, Fixed	1
R13	2615-487	10K Ohm 1W, Fixed	1
R14	2652-327	400 Ohm 10W, Fixed	1
SWITCHES			
SW1	2513-126	Toggle SPST	1
TRANSFORMERS			
T1	4461-501	Power	-
T2	4443-304		-
TRANSISTORS			
Q1	2848-050	2N1536	1
Q2	2848-050	2N1536	*
MISCELLANEOUS			
	2488-106	Fuseholder	1
	2488-141	Fuseholder	1

LORAIN PRODUCTS CORP.
Lorain, Ohio
August 19, 1968

ELECTRICAL PARTS LIST
LORAIN 4871-311 TONE GENERATOR SUB-ASSEMBLY

The quantity of spare parts (except fuses) listed should be sufficient for ten or less 4871-311 TONE GENERATOR SUB-ASSEMBLIES for at least 18 months.

Ref. Desig.	Lorain Products Corp. Part No.	Description	Quantity Rec. Spares
CAPACITORS			
C101	2714-541	1.5UF 230VAC	1
C102	2713-461	.5UF 600V	1
DIODES			
CR101	2812-310	1N4818 Silicon	1
CR102	2812-310	1N4818 Silicon	*
FUSES			
F101	2483-215	.50A, Cartridge	1
RESISTORS			
R101	2651-744	3K Ohm 5W, Fixed	1
R102	2683-268	2.5K Ohm 2W, Variable	1
R103	2662-839	100 Ohm 2W, Fixed	1
R104	2614-294	20K Ohm .5W, Fixed	1
R105	2614-224	24 Ohm, Fixed	1
TRANSFORMERS			
T101	4437-502	Oscillator Blocking	-
T102	4468-003		-
TRANSISTORS			
Q101	2848-060	2N1537	1
MISCELLANEOUS			
	2488-100	Fuseholder	1

*This part appears more than once in this list. Use recommended spare quantity stated where part first appears in this list.

LORAIN PRODUCTS CORP.
Lorain, Ohio
August 16, 1 68

ELECTRICAL PARTS LIST
LORAIN 4871-009 RINGING GENERATOR ASSEMBLY

The quantity of spare parts (except fuses) listed should be sufficient for ten or less RINGING GENERATOR ASSEMBLIES for at least 18 months.

Ref. Desig.	Lorain Products Corp. Part No.	Description	Quantity Rec. Spares
CAPACITORS			
C201	2731-248	1800UF 40V, Electrolytic	1
C202	2731-248	1800UF 40V, Electrolytic	*
C203	2731-162	100UF 12V, Electrolytic	1
C204	2715-249	.1UF 200V	1
C205	2713-436	.047UF 600VDC, Fixed	1
C206	2714-537	1.05UF 480VAC	1
DIODES			
CR201	2812-121	1N537 Silicon	1
CR202	2812-121	1N537 Silicon	*
INDUCTORS			
L201	4424-014	Choke	-
L202	4424-503	Linear Choke	-
L203	4428-008	Coil Tone	-
RESISTORS			
R201	2662-863	1K Ohm 2W, Fixed	1
R202	2662-863	1K Ohm 2W, Fixed	*
R203	2662-851	330 Ohm 2W, Fixed	1
R204	2681-425	1.5K Ohm 10W, Adjustable	1
R205	2662-845	180 Ohm 2W, Fixed	1
R206	2662-845	180 Ohm 2W, Fixed	*
R207	2662-845	180 Ohm 2W, Fixed	*
R208	2651-347	4.7K Ohm 3W, Fixed	1
R209	2662-829	39 Ohm 2W, Fixed	1
R210	2662-829	39 Ohm 2W, Fixed	*
R211	2651-329	500 Ohm 3W, Fixed	1
TRANSFORMERS			
T201	4473-502	Oscillator	-
T202	4451-603	Transistor	-
TRANSISTORS			
Q201	2847-098	2N525	1
Q202	2847-098	2N525	*
Q203	2848-060	2N1537	1
Q204	2848-060	2N1537	*

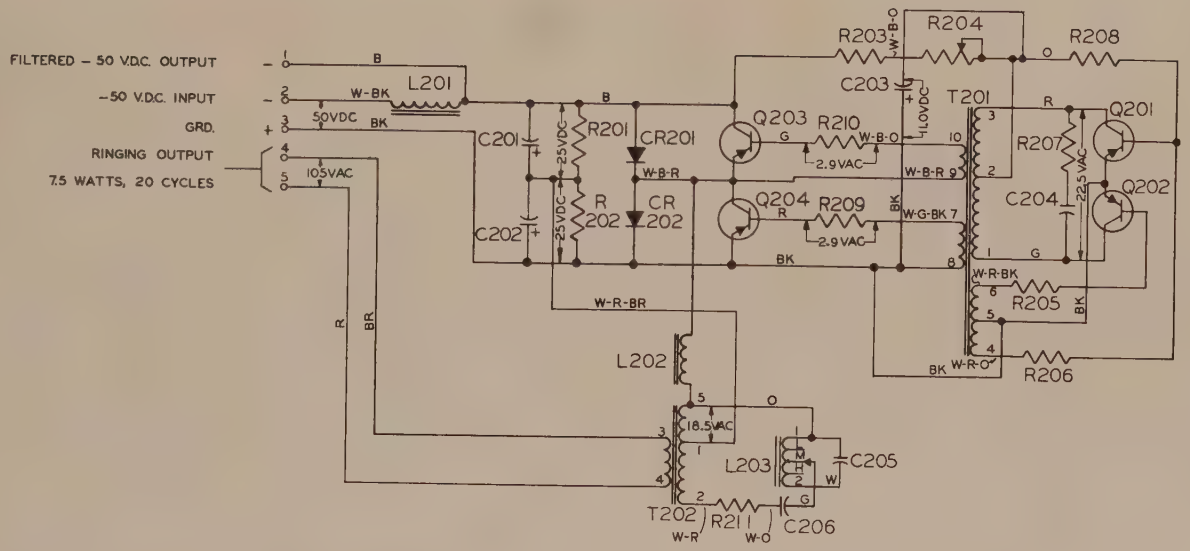
*This part appears more than once in this list. Use recommended spare quantity stated where part first appears in this list.

ELECTRICAL PARTS LIST
LORAIN 4871-009 RINGING GENERATOR ASSEMBLY

Ref. Desig.	Lorain Products Corp. Part No.	Description	Quantity Rec. Spares
MISCELLANEOUS			
	2868-105	Socket Power Transistor	1

LORAIN PRODUCTS CORP.
Lorain, Ohio
September 24, 1968

SD-981-02



RC-188	CHANGE SLIP NO	DWG CHGD BY	DATE	REVISION
1	6978 JL	2 12 62		CR201, CR202 WAS IN91, IWG
2	7683 D R M	7 16 62		Q203, 204 WERE 2N1159 13WH
3	7987 DV	8 22 62		12F REPLACED BY 132F
4	9135 HB	2 5 63		WIRE COLOR CHG'D
5	10428 E PRATT	11 8 63		CORRECT DESCRIPTION OF C201 & C202
6	14881	12 1M 65		C206 WAS PT. NO. 17 F.
7	15383 D Gray	6 6M 66		C205 WAS 58 F
8	16491 H. Miller	11 14M 66		R211 WAS 300 OHMS.
9	18280 E. PARHAM	9 10M 68		C 203 WAS 100UF 12 V.D.C.

PARTS LIST

DESIG.	PT. NO.	DESCRIPTION
C201	2731-248	1800 MFD. 40 V.D.C.
C202	2731-248	1800 MFD. 40 V.D.C.
C203	2731-162	250 MFD. 12 V.D.C.
C204	2715-249	.1 MFD. 200 V.D.C.
C205	2713-436	0.047 MFD. 600 V.D.C.
C206	2714-537	1 MFD. 480 V.A.C.
CR201	2812-121	
CR202	2812-121	
L201	4424-014	
L202	4424-503	
L203	4428-008	
Q201	2847-098	
Q202	2847-098	
Q203	2848-060	
Q204	2848-060	
R201	167Y	1000 Ω, 1 WATT
R202	167Y	1000 Ω, 1 WATT
R203	2662-851	330 Ω, ½ WATT
R204	2681-425	1500 Ω, 10 WATT, ADJUSTABLE
R205	2662-845	180 Ω, ½ WATT
R206	2662-845	180 Ω, ½ WATT
R207	2662-845	180 Ω, ½ WATT
R208	2651-347	4700 Ω, 1 WATT
R209	242Y	39 Ω, ½ WATT
R210	242Y	39 Ω, ½ WATT
R211	2651-329	500 Ω, 3 WATT
T201	4473-502	
T202	4451-603	

ENGRG. NOTES:

101. VOLTAGE MEASURMENTS SHOULD BE WITHIN ± 5% OF VALUES SHOWN WITH NOMINAL VOLTAGE APPLIED AND NO D.C. LOAD. THE VALUES SHOWN ARE AS MEASURED WITH A METER HAVING A SENSITIVITY OF 5000 OHMS/VOLT ON AC RANGES. 20000 OHMS/VOLT ON DC RANGES.
102. AUDIBLE RINGING TONE TONE LEVEL IS ADJUSTED WITH TAPS ON L203. LEVEL CAN BE SET LOW (L) MEDIUM (M) OR HIGH (H).

NOTICE

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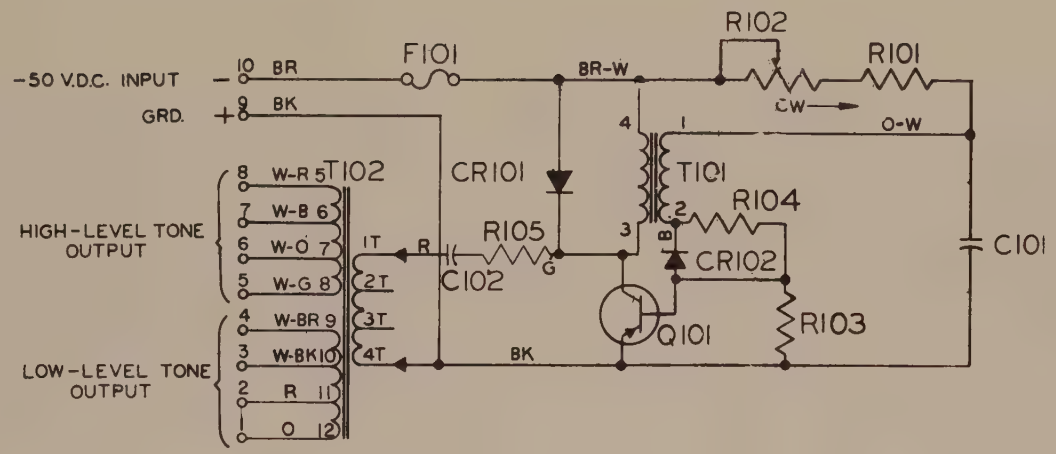
SCHEMATIC DIAGRAM
FOR
ASSEMBLY 4875-009
7.5 WATT, 20 CYCLE
RINGING GENERATOR

LORAIN Products Corporation
LORAIN, OHIO
AND
LORAIN PRODUCTS (CANADA) LTD. ST. THOMAS, ONTARIO

DR BY RJH	DATE 8-31-61	SCALE	
CH. BY	DATE 9-1-61	PART NO.	
APP BY RJH	DATE 9-1-61		SD-981-02

SD-981-03

RE ISS	CHANGE SLIP NO.	DWG CHG'D BY	DATE	REVISION
10	16196 C.H. 10-7-66 E. Gehrt Smith 10-13-66	G. Bringman 10 4M 66 Gilder 10-13-66		R105 WAS 13Ω CR101 WAS IN537 CR102 WAS IN538 BWH 10-12-66



LOW-LEVEL TONE

TAPS	VOLTAGE
1 AND 2	0.33
2 AND 3	0.66
1 AND 3	0.99
3 AND 4	1.31
2 AND 4	1.64
1 AND 4	2.30

HIGH-LEVEL TONE

TAPS	VOLTAGE
5 AND 6	1.64
6 AND 7	3.29
5 AND 7	4.93
7 AND 8	5.57
6 AND 8	9.86
5 AND 8	11.50

PARTS LIST

DESIGNATION	PART NO.	DESCRIPTION
C101	2714-541	1.5 MF, 230 V AC
C102	15F	0.5 MF, 600V DC
CR101	2812-310	IN4818
CR102	2812-310	IN4818
F101	14M	1/2 AMP AGC
Q101	34WH	2N1537
R101	116Y	3000Ω 5W
R102	242YA	2500Ω 2W POT.
R103	228Y	100Ω 1/2 W
R104	135Y	20,000 1/2 W.
R105	2614-224	24Ω 1/2 W.
T101	1047G	
T102	1046G	

SCHEMATIC DIAGRAM FOR 25 MILLIWATT TONE GEN. ASSEMBLY 524AS

LORAIN Products Corporation
LORAIN, OHIO
AND
LORAIN PRODUCTS CANADA LTD. ST. THOMAS, ONTARIO

RFH	8-25-61	
	8-26-61	
Maynard Smith	8/29/1961	SD-981-03
BWH	8-29-61	

SD-421-01

FIG. 1

BATTERY ELIMINATOR
46-52 VDC, 12 AMPS CONTINUOUS
18 AMPS INTERMITTENT

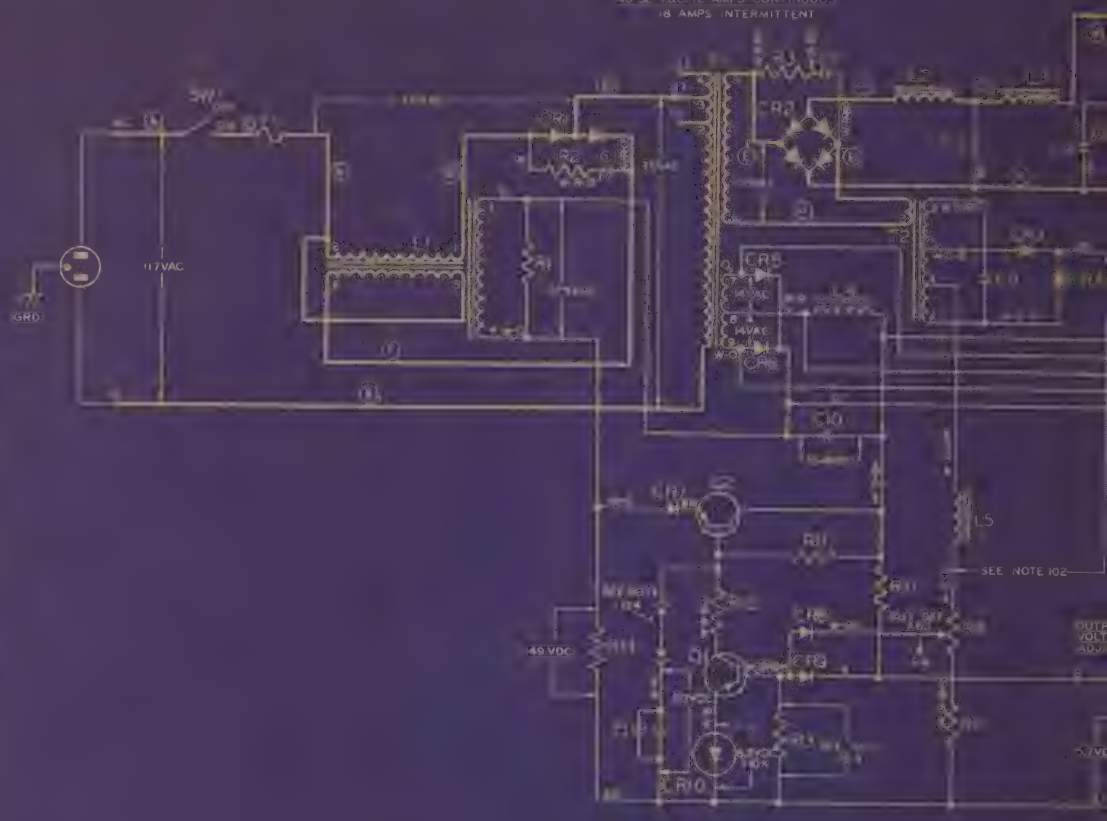
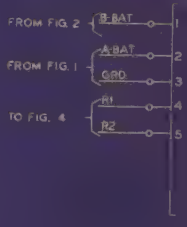


FIG. 2



FIG

525AS RINGING
SD-981-

ENGRG NOTES:

101. VOLTAGE MEASUREMENTS SHOULD BE WITHIN ± 5% OF VALUES SHOWN WITH NOMINAL VOLTAGE APPLIED AND NO DC LOAD. THE VALUES SHOWN ARE AS MEASURED WITH A METER HAVING A SENSITIVITY OF 5000 OHMS/VOLT ON AC RANGES, 20000 OHMS/VOLT ON DC RANGES.

102. AT NOMINAL INPUT & 12 AMP LOAD, THE DC VOLTAGE BETWEEN THESE POINTS SHOULD BE GREATER THAN 7 VOLTS.

103. THE VOLTAGE DROP ACROSS R13 SHOULD BE APPROXIMATELY 0.1 VOLTS GREATER THAN THE VOLTAGE MEASURED ACROSS CR10.

104 WHEN OPERATED WITH BATTERY REMOVE STRAP.

105. WHEN CHARGE FAILURE ALARM IS ADDED, REMOVE JUMPER BETWEEN TERMINALS 11 & 12.

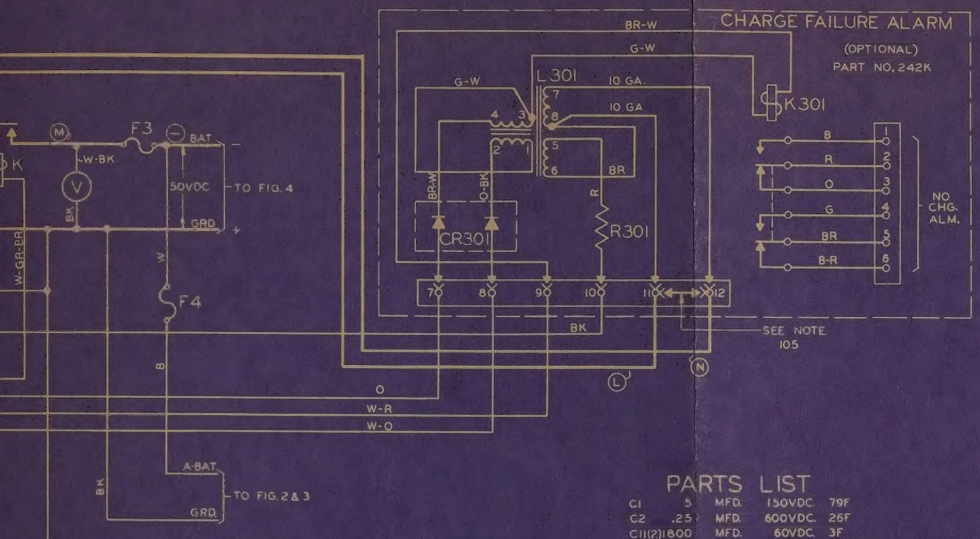
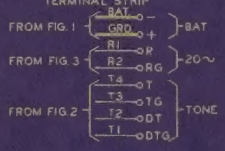


FIG. 4
TERMINAL STRIP



PARTS LIST

C1	5 MFD.	150VDC.	79F
C2	.25 MFD.	600VDC.	26F
C11(2)	1800 MFD.	60VDC.	3F
C9	1.5 MFD.	230VAC.	2714-541
C10	100 MFD.	25VDC.	73F
C3,4	8500 MFD	75VDC.	188F

CR1	88WK	
CR2	87WK	
CR3,CR4	72WG	(1N1221)
CR5,CR6,CR7	60WG	(1N1218)
CR8,CR9	76WG	(1N537)
CR10	89WG	(1N753)
CR301	335W	

F1	15AMP BAF.	27M
F3	20AMP BAF.	29M
F4	1AMP. AGC.	13M
K	RELAY	127KA
K301		5KA4

L1	1236G
L2	1238G
L3	1239G
L4	1246G
L5	899G

Q1,Q2	35WH (2N1536)

R1	100	OHM	1 WATT	165Y
R2	22	OHM	1 WATT	264Y
R3	82	OHM	2 WATT	271Y
R4	75	OHM	100 WATT	334Y
R5	750	OHM	5 WATT	49Y
R6	25	OHM	2 WATT POT.	209YA
R7	200	OHM	10 WATT ADJ.	191YA
R8	40	OHM	4 WATT POT.	205YA
R9	50	OHM	1 WATT	211Y
R10	7000	OHM	3 WATT	240Y
R11	1000	OHM	5 WATT	103Y
R12	500	OHM	3 WATT	292Y
R13	10,000	OHM	1 WATT	206Y
R14	400	OHM	10 WATT	176Y

R301	500	OHM	10 WATT	17Y

T1	1237G
T2	1240G

RE-ISS	CHANGE SLIP NO	DISC CHGD BY	DATE	REVISION
1	6381 RW	10		PHOTO. REPRO.
			10-31-62	N.C.A. ADDED
		61		W.R.B. 10-29-61
2	7000 R	3		CR8,9
	A	7		WERE IN91 IWG.
	S	62		Q1 & 2 WERE 8WH
				2N457. NCA
				CHG'D TO CFA.
				524AS & 525AS
				REMOVED.
3	8373 WB	10		T1-T4 INTERCHG'D
		31		
		62		W.R.B. 11-2-62
4	12709	10		R3 WAS 254Y
		7		
		64		R. Van Dewe 10-14-64
5	13928	2	25 65	WIRE COLOR REMOVED
6	14304	4-16-65		C3 AND C4 WERE C3-6 AND C7-8
				W.R.B. 4-16-65
7	14881	12-3-65		C9 WAS 38F
				W.R.B. 12-3-65
8	16460	6-21-66		CAP. OF C11 CHG'D

8

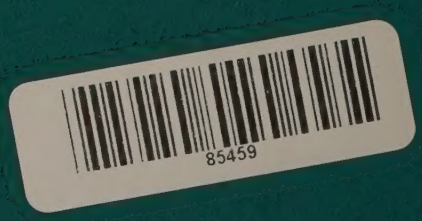
SCHEMATIC DIAGRAM
FOR
MODEL 1281 AND 1284 PWR PLANT

LORAIN Products Corporation
LORAIN, OHIO
AND
LORAIN PRODUCTS CANADA LTD. ST THOMAS, ONTARIO

DR. BY	RW	DATE	10-24-61
CH. BY	RD	DATE	10-24-61
APP. BY	W.R.B.	DATE	11-1-61

SD-1421-01

Made in U.S.A. by
BEAVERITE
BEAVER FALLS, N.Y.
809-180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